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ELECTRONIC SYSTEMS DIVISION  
(U.S. AIR FORCE SYSTEMS COMMAND)

HISTORICAL REPORT

On "Cracker Jack"

December 1962

VOLUMES I AND II

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Copy 2 of 4 copies

Electronic Systems  
Division

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ESD HISTORICAL REPORT  
on  
"Cracker Jack"

December 1962

Volume I

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## FOREWORD

This report on the operations of the USAF Electronic Systems Division in the emergency which began with the President's 22 October 1962 statement on Cuba was prepared in accordance with a directive issued by the Air Force Chief of Staff\* and instructions issued by the Command Historian, Headquarters Air Force Systems Command, USAF on 6 November 1962. \*\*

On 31 October, in accordance with instructions from AFSC, ESD undertook to identify costs related to the emergency by placing the phrase "CUBAN SITUATION" on all requests or documents concerned with the obligation or expenditure of such funds. # On 2 November the Comptroller informed all ESD elements that the nickname "Cracker Jack" would be used in lieu of "Cuban Situation," ## and it is from the memorandum of 2 November that the title of this report is derived.

Although the term "Cracker Jack" was originated in connection with Cuba, the October crisis had global implications. Consequently, this account contains information on ESD activities in many areas of the world.

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\* Msg, AFSC(TS) SCE 23-10-56, [ALAFSC 1425/62] to ALAFSC, 23 Oct 62, Classification changed to FOR OFFICIAL USE ONLY 5 Nov 62. [SD (Supporting Document) #1, Vol. II].

\*\* Memo, Hq AFSC to All Division/Center/CMR Historians, AFSC, subj: "Documentation of Current Contingency," 6 Nov 62. [SD #2]

# Memo, Hq ESD Comptroller to All Elements ESD, subj: "Identification of Costs Incurred as a Result of the Cuban Situation," 31 Oct 62. [SD #3]

## Memo, Hq ESD Comptroller to All Elements ESD, subj: "CRACKER JACK," 2 Nov 62. [SD #4]

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### The ESD Emergency Command Post

On 22 October 1962, at 1800 Eastern Standard Time (EST) the Electronic Systems Division (ESD) assumed Defense Condition 3 in accordance with a decision of the Joint Chiefs of Staff and a directive of Air Force Systems Command (AFSC) headquarters.<sup>1</sup> Subsequently, a full-time emergency command post was activated in the conference room of the 3245th Air Base Wing, located at some distance from ESD headquarters. Staffed by personnel drawn from ESD and Wing, the command post was headed by the Chief of Plans and Programs, ESD.<sup>2</sup> The Electronic Systems Division remained in Defense Condition 3 almost 37 days. At 1115 EST, 28 November, it was instructed by AFSC headquarters to resume Defense Condition 5 (normal peacetime operation), and discontinued its command post at 1415 EST.<sup>3</sup>

The Chief of the Operations Division of the ESD Plans and Programs Office observed that the practice of activating an emergency command post only under unusual circumstances, and in a building somewhat remote from mission headquarters led to "lost motion" in starting and carrying on operations. Noting that efficiency could be increased by locating the emergency command post closer to or actually in ESD headquarters and staffing it on a full-time basis even during normal conditions, AFSC was asked to evaluate the latter proposal with a view toward making it mandatory under AFSC Regulation 23-30.<sup>4</sup>

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Readiness and Security Measures

The October crisis touched off a broad spectrum of actions designed to improve the alert posture and physical security of ESD headquarters. The war plan and disaster plan were reviewed, the capability of the headquarters to support the operational commands was examined, and the status of the alert staff checked out. A number of detailed actions on physical security were set in motion. Retraining and requalification of key personnel in small arms weapons were started, and entry doors to flight line buildings were closed off except for a minimum essential number. A location status board for the Commander and key personnel was maintained in the command post, plans for the recall of reserve personnel were prepared, and temporary duty travel kept to a minimum. Proficiency flights were restricted to the Laurence G. Hanscom Field area and to round-robin flights except for T-33 aircraft which were permitted to make "out and backs."<sup>5</sup>

Several problem areas came to light as ESD moved to improve security. For one thing, the open base policy in effect at Hanscom, and the physical layout of the field and surrounding municipal activities do not lend themselves to positive security control. The security problem is further complicated because identification cards are not normally issued to all civilian personnel on the base.<sup>6</sup> Civilian identification cards are being prepared, and AFSC has been asked to consider the development of a standard identification card for all AFSC personnel.<sup>7</sup>

A problem arose because of an apparent misunderstanding of Operation MINIMIZE, placed in effect on 22 October. The objective of MINIMIZE was to reduce message and telephone traffic in order to

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assure expeditious handling of vital messages. Clarifying instructions were issued on 24 November.<sup>8</sup>

One other problem affecting the alert posture must be mentioned. When the crisis began, ESD had three F-102 test aircraft at Griffiss Air Force Base participating in the 412L Category II Test. A few hours later, the 26th Air Division, Air Defense Command, advised that it had assumed operational control of the pilots and aircraft and had begun to "combat configure" the latter. When ESD brought this to the attention of AFSC the aircraft were returned to ESD control. The incident points up a need for clarification of the prerogatives of tactical commanders to assume control of test aircraft. ESD has recommended that a policy be established for the control and use of test aircraft during periods of increased tension.<sup>9</sup>

#### Emergency Program Review

On 22 October, the day of the President's statement, AFSC headquarters asked the ESD Commander, Major General Charles H. Terhune, Jr., "what programs should we accelerate and how much would it cost?"<sup>10</sup> On the next day it called for a review of the ESD R&D Program Summary (RCS: AF-R13) to this effect,<sup>11</sup> ESD replying on the 24th as follows:<sup>12</sup>

	<u>Systems</u>	<u>Tech. areas</u>
<u>Code 1</u> (systems, projects, and programs to be emphasized or accelerated)	19	28
<u>Code 2</u> (systems, projects, and programs to be continued as resources are available)	8	58
<u>Code 3</u> (systems, projects, and programs to be cancelled in time of war)		31

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Then on the 24th, AFSC asked all laboratories throughout the command to review in-house and contractual programs "to determine those which may be useful immediately in support of operating commands,"<sup>13</sup> and to estimate the cost of "going to multiple shift operation and/or overtime in event of decision to expedite acceptance and delivery of system and other weapons to using commands . . ."<sup>14</sup> On the 25th it made this instruction "applicable to all activities" declaring that requests of using commands for technical assistance were to be given the priority and resources required, and advised that all in-house and contractual programs were to be reviewed to identify those immediately useful, together with the additional resources needed to bring them to fruition as quickly as possible. On the assumption that "the current military situation may be prolonged," it asked for recommendations or any advanced ideas that might be exploited and the resources required to effectuate them.<sup>15</sup>

In the meantime, the ESD Deputy for Systems Management, noting that "the recently completed 'Crash' review of possible ESD actions revealed several approaches for more expeditious availability of systems in addition to the application of additional funding for overtime," asked all system program offices (SPOs) and the Directorate of Communications Programs for a more deliberate review by 1700 hours (local time) 29 October. This, he said, should identify ESD potentials for partial or complete systems activation between 24 October 1962 and 1 February 1963, and between 24 October and 1 April 1963. For guidance, he said that estimates should be based on "indefinite continuation of the tension centered on the Cuban situation" and "probable retaliatory pressure exerted on Allied access to Berlin."<sup>16</sup>

Air Force Systems Command headquarters had not originally set a deadline for the review it had requested on the 24th, but on 2 November

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it asked for replies by the 5th.<sup>17</sup> The Electronic Systems Division found it convenient to submit two reports instead of one, the first dealing with systems and handcarried to Washington on the 7th,<sup>18</sup> the second treating all other areas and forwarded on the 9th.<sup>19</sup>

The 7 November report examined each system for the following:

A determination of the early availability of usable hardware, either in consonance with the pertinent program objectives, or as a separate item usable in a general sense without regard for the furtherance of any particular program objective.

An evaluation of the possibilities of program acceleration to achieve earlier operational dates while still retaining primary program objectives.

An exploration of alternatives (including major program revisions) which would give an earlier operational capability, although the capability might be degraded temporarily or permanently to some degree and consequently might forfeit all possibilities of satisfying original program objectives.

In each instance the report indicated general estimates of the type and quantity of additional resources, as well as the special actions, waivers, and other conditions that might be required to achieve the alternative goals.

In submitting this system review, ESD was at pains to emphasize that its recommendations were formulated from a management and technical point of view, and therefore might not be wholly consistent with recommendations and priorities listed in the AF-R13 report (USAF R&D Program Summary), or the desires of using commands or higher echelons. It stressed that system program acquisition, objectives, and funding, as currently planned, would in many cases be sacrificed to the overriding demands of emergency situations (which would be highly disruptive in most cases) and should not be undertaken except under

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emergency conditions. It also observed that the review, while as thorough as time permitted, was obviously not as detailed or exhaustive as might be desired. It asked to be notified immediately if any of the suggested emergency alternatives were to be implemented "in order that more detailed scrutiny of costs, schedules, and operational benefits on problems can be undertaken."

The report on the nonsystems area examined contractual programs, including applied research and advanced technology which might be accelerated and useful immediately in support of the using commands, and advanced ideas which might be exploited if the current military situation were prolonged. As in the case of the report on systems, the "crash" nature of the nonsystems review was emphasized.

The 7 and 9 November reviews revealed that the AFSC headquarters WPB/WPS (Basic War Plans) provided but limited guidance in evaluating, identifying, and recommending programs which should be accelerated or terminated on "D" day. It was suggested to AFSC that paragraph 3b of Annex H ("tasks common to all task organizations") to the WPB/WPS include a requirement that programs be monitored to expedite recommendations in an emergency and, further, that AFSC indicate the definitive criteria, guidance, procedures, and format to be used.<sup>20</sup>

Funding

On 25 October AFSC informed ESD<sup>21</sup> fund limitations or restrictions, including those associated with gold flow, should not be allowed to inhibit essential support or mission accomplishment in connection with the implementation of the President's statement of 22 October. At the same time it wished to identify and record costs associated with Cracker Jack. ESD was asked to report, by 31 October, actual

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additive commitments incurred as of 23 October, a "best estimate" of cumulative additive commitments and obligations to be incurred through 31 December 1962, and for the latter period, the net adjustment in current allocation needed to cover estimated requirements.<sup>22</sup> A breakdown of the requested figures was specified, and weekly change reports to the 23 October submission were directed.

The first ESD report (RCS: AFSC C-117) was submitted on 31 October.<sup>23</sup> Since a number of financial transactions had not crystallized, it showed no actual additive commitments incurred as of 23 October. It did, however, estimate that cumulative additive commitments and obligations to be incurred through 31 December 1962 would total \$1,154,000, and that this amount was also the net adjustment required in the current sub-allocation to cover estimated Appropriation 400 requirements (operations and maintenance). ESD funding reports on Cracker Jack through 23 November are summarized in Table I, pages 8-9.<sup>24</sup>

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Table I

Estimated and Actual Commitments and Obligations for Cracker Jack:  
Reported by ESD to AFSC Through 23 November 1962  
(RCS AFSC C-117)

Estimate of cumulative additive commitments and obligations  
to be incurred through 31 December 1962 by major object class.

Appropriation 5733400, Operations and Maintenance, Project 438, Base Operations and Maintenance	\$1,187,000
Object Class 1100, Personnel Compensation	\$ 8,000
Object Class 2100, Travel & Transportation of Persons	7,000
Object Class 2590, Other Contractual Services	1,150,000
Object Class 2650, Medical Supplies	1,000
Object Class 2690, Other Supplies	21,000
	<u>\$1,187,000</u>
Net Adjustment needed in current sub-allocation	\$1,187,000
Appropriation 5733501, Military Personnel Project 551, Subsistence	\$10,000
Object Class 2630, Subsistence (94th TCWg)	\$10,000
Net Adjustment needed in current sub-allocation	\$10,000
Appropriation 57X3080, Other Procurement Budget Program 8400, Electronics & Telecommunications Equipment	\$375,000
Project 8403, 416L <sup>a</sup>	\$ 30,000
Project 8412, 474L <sup>b</sup>	345,000
	<u>\$375,000</u>
Net Adjustment needed in current sub-allocation	\$375,000

a. Ref: Part III, Clas Msg ESOPS 2-11-6-E, 1 Nov 62 to SCCC.

b. Rehabilitation of vans at Camp Kilmer, USAF Msg AFOAC-OP R3000.

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Table 1 (Contd.)

Estimated total dollar value of items or services provided for which no commitment and/or obligation is recorded, but will subsequently require replacement from local appropriated funds:

Estimated total cost for materials furnished that must be replaced but will not be funded from local allotment

Aviation POL \$30,000

Actual additive commitments and obligations as of 31 October 1962.

Appropriation 5733400, Project 438, Object Class 2100: \$2,170

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## NOTES

1. Msg, AFSC (S), SCANC-2/22-10-15 to ALAFSC [ALAFSC 1424/62].  
[SD #5.]
2. Memo, ESOLO to ESG, subj: "Command Post Deficiencies,"  
28 Nov 62, Tab A, ESD Command Post Operations. [SD #6.]
3. ESP CP log, in possession of Lt Col R. B. Brown, Ch, Opns Br,  
Opns Plng Div, Plans and Programs.
4. See n 2.
5. Ltr, Hq ESD, ESOLO, to AFSC (SCIA), subj: "ESD Implementing  
Actions to AFSC, WPB/WPS and AFSC Message CG-1 Dated 25 Oc-  
tober 1962," 9 Nov 62 (S), w/2 Atchs: (1) Status Rept Summary,  
J-73, 233-1C-1 (S) and (2) Composite Report (Memo to ESO subj:  
ESD Response to Gen. Schriever's Message of 25 Oct 62, from  
Lt Col Robert B. Brown, Chief, Opns Br, Opns Plng Div, Plans  
and Programs, dated 6 Nov 1962) (C). The AFSC msg noted in  
ltr subject is TWX, AFSC (CP-CG-1) to ALAFSC (S). [SD #7.]
6. See n 5 (Composite Report).
7. See n 5 (Ltr 9 Nov 62).
8. Memo, ESOLO, to ESG, subj: "Command Post Deficiencies,"  
28 Nov 62, see Note 2; Memo, Hq 3245th ABW, CWA, subj:  
"Implementing Instructions for 'MINIMIZE,'" 24 Oct 62. [SD #8.]
9. Memo, ESOLO to ESG, subj: "Command Post Deficiencies,"  
28 Nov 62, see n 2.
10. Memo for Record by Col C. M. Smith, ESOP, subj: "Telecon -  
Col Reber (AFSC) and Col Smith (ESD)," 24 Oct 62. [SD #9.]
11. Msg, AFSC (U) SCSA (SDO) 23-10-5, to ALAFSC [ALAFSC 1430/62],  
23 Oct 62. [SD #10.]
12. Msg, ESD ESOP 24-10-39, to AFSC, 24 Oct 62. [SD #11.]
13. Msg, AFSC (C) CP 63-19 AFSC CP, to ALAFSC, 24 Oct 62. [SD #12.]

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## NOTES (Contd.)

14. Msg, AFSC (S) CP 63-25, to ESD, 24 Oct 62. [SD #13.]
15. Msg, AFSC (C) CP 63-45, to ALAFSC, 25 Oct 62. [SD #14.]
16. Memo, Hq ESD, Col Norman J. McGowan, Deputy Sys Mgt to All SPOs and Dir of Communications Programs, subj: "War Planning," 24 Oct 62. [SD #15.] The Directorate of Space Communications, on 31 Oct 62, furnished estimates on 19 communications items; see Memo, Joseph A. Plihal, System Program Director, SPACECOM, ESSDL/88 to ESSJS, subj: "War Planning," 31 Oct 62 (S). [SD #16.]
17. Msg, AFSC, CP SCT 63-201 to ALAFSC (U). [SD #17.]
18. Ltr, Hq ESD, Ofc of Comdr to AFSC, subj: "(U) Emergency Program Actions," 7 Nov 62 (U). [SD #18.]
19. Ltr, Hq ESD, Ofc of Comdr to AFSC, subj: "(U) Emergency Program Actions," 9 Nov 62 (U). [SD #19.] The ESD memo, subj: "War Planning," 24 Oct 62 (above) provided much of the information included in the ESD ltrs of 7 and 9 Nov 62.
20. Memo, ESOLO to ESG, subj: "Command Post Deficiencies," 28 Nov 62; Tab B, Basic War Plans. [SD #6.]
21. Msg, AFSC (U) SCCB 25-10-2 to ALAFSC [ALAFSC 1449/62]. [SD #20.]
22. Ibid.
23. Msg, ESD (U) ESCB 31-10-12-E to AFSC, SCCB. [SD #21.]
24. Msgs, ESD to AFSC: (1) (U) ESCB 9-11-2-E, 9 Nov 62; [SD #22.] (2) (U) ESCB 16-11-3-E, 16 Nov 62 [SD #23.] (3) (U) ESCB 23-11-4-E, 23 Nov 62 [SD #24]. Interview by Charles J. Smith, ESD Hist Div Staff, with Thomas T. Weeks, Asst Chief, Budget Div, 3 Dec 62. ESD Cracker Jack funding reports after 23 Nov are not included.

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Special Subjects Relating to Systems

Red Slip

Within hours of the President's statement the Chief of Staff sought information on the availability, in the United States, of ground mobile radio transmitting equipment produced for European tropo networks. By 2120Z the next day ESD was able to inform the Chief of Staff of sources or potential sources of the desired equipment, and on 24 October SPACECOM became the focal point for the management of Project SCABBARDS, the Confidential code word assigned to the task of assembling the components, power equipment, and portable equipment for 14 tropo sets. The code word SCABBARDS was later dropped in favor of the unclassified nickname RED SLIP. Firm dates on the availability of most of the needed items were established at a 26 October meeting of SPACECOM with representatives of AFCS, GEEIA, ROAMA, TAC, BMEWS Project Office, and the Federal Electric Corporation. The rehabilitation of two AN/FRC-39 (fixed radio communications) vans at Camp Kilmer, New Jersey, was a major portion of the USAF-assigned project; by 7 November work on the vans was complete and checked out.<sup>25</sup>

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25. Red Slip Documents:

- Msg, CSAF to ESD (S) AFOAC-OP 92559, 22 Oct 62. [SD #25.]
- Msg, ESD to CSAF (S) ESSDW 23-10-216-E, 23 Oct 62. [SD #26.]
- Msg, Hq USAF to ESD (S) AFOAC-OP 93030, 24 Oct 62. [SD #27.]
- Msg, CSAF to ESD (S) AFOAC-OP 94159, 2 Nov 62. [SD #28.]
- Msg, ESD to USAF (S) ESSDW -29-10-246-E, 29 Oct 62. [SD #29.]
- Msg, BMEWS/ESD to WECO 220 Church St., New York, N.Y. (S) ESSBC 29-10-112, 29 Oct 62. [SD #30.]
- Msg, ESD to USAF (U) ESSDW-7-11-46-E, 7 Nov 62. [SD #31.]

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Spacecom (Wet Wash)

Another requirement which came to the fore during the Cuban crisis stemmed from Joint Chief of Staff (JCS) approval for an extension of wide band communications from the Philippines to South Vietnam. Electronic Systems Division (Spacecom) was asked to work closely with GEEIA (Ground Electronics Engineering Agency) to develop an acceptable item for the project to be included in the Fiscal Year 1964 USAF budget, and on 19 November ESD was requested to conduct an on-the-spot engineering survey and a study of the money and manpower implications of the JCS decision. Completion of this project would give Spacecom a continuous communications system extending around the world.<sup>26</sup>

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26. Wet Wash Documents:

Msg, Hq USAF to AFSC (S) AFOAC-OP 73059, Mar 62.  
[SD #32.]

Msg, AFSC to ESD (S) SCSED 28-3-134, Mar 62. [SD #33.]

Msg, CSAF to AFSC (S) AFOAC-OP 95604, 14 Nov 62. [SD #34.]

Msg, AFSC to ESD (S) SGSED-19-11-73, 19 Nov 62. [SD #35.]

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The Department of Defense (DOD) also acted to expedite the construction of tropo scatter facilities in Spain, Italy, Greece, and Turkey, and on 15 November representatives of 486L briefed AFSC on the funding and procurement needed to meet the DOD directive. By 24 November there was some doubt as to whether DOD and the Air Staff still favored expedited action, and ESD turned to the study of costs and operational dates on a nonexpedited basis. <sup>27</sup>

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**27. 486L Medcom Documents:**

Msg, Hq USAF to AFSC (S) AFOAC-OP 94578, 5 Nov 62.  
[SD #36.]

Outline of 486L Medcom System Briefing Agenda, 15 Nov 62.  
[SD #37.]

Msg, AFSC to ESD (U) SCSED 23-11-93, Nov 62. [SD #38.]

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On 11 May 1962 ESD presented to Hq USAF a preliminary feasibility report on a wide band tropo circuit from Florida to the Canal Zone, designated as Project Feed Back. Shortly after the President's statement on Cuba, ESD headquarters was alerted that plans to expedite Feed Back were under study. Although GEEIA did not favor the proposed Key West--Grand Cayman routing, DOD directed planning be based on the use of Grand Cayman, Swan Island, and Great Corn Island as sites between Florida and Fort Sherman, Canal Zone. While ESD contended that it was most desirable that Feed Back be implemented on a nonaccelerated basis, which would require 18 to 24 months, a meeting at the Defense Communication Agency on 28 November set a target date of 1 June 1963 for Feed Back to operate at 24 channels.<sup>28</sup>

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**28. Feed Back Documents:**

Msg, CSAF to AFSC (S) AFOAC-OP 93444, 27 Oct 62.  
[SD #39.]

Msg, Eastern GEEIA Brookley AFB to GEEIA Griffiss AFE (S) ZMMWE 6 2-79, 15 Nov 62. [SD #40.]

Msg, CSAF to AFSC (S) AFOAC-OP 96276, 17 Nov 62.  
[SD #41.]

Msg, Hq ESD to AFSC (S) ESSDW-21-11-133-E, 21 Nov 62.  
[SD #42.]

Outline summary 28 Nov 62 meeting at DCA with agenda and list of attendees. [SD #43.]

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Impact of Crisis on System 412L

On 21 October, the day before the President's speech, the Tactical Air Command was obliged to take control of certain tactical equipment then held at 412L test sites. On 25 October the Air Defense Command required the use of certain other equipment being tested at the 412L site at Giebelstadt, Germany. Each action caused a delay of about one month in the program schedule of this system (Air Weapons Control System).<sup>29</sup>

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29. 412L Documents:

Msg, TAC Langley AFB to 412L SPO Hanscom Fld (S)  
DOC-C 2 11951 [Notification of use of tactical equipment],  
21 Oct 62. [SD #44.]

Msg, ESD Det 9 Lindsey AS Germany to ESD/ESSK Hanscom  
Fld (S) ESUHK-2 26-10-500 [System testing terminated at  
Giebelstadt], 26 Oct 62. [SD #45.]

Ltr, ESD ESSKL to ESEH (Dr. Murphy), subj: "(U) 412L  
Historical Data," 28 Nov. 62. [SD #46.]

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~~CONFIDENTIAL~~~~UNCLASSIFIED~~Impact of Cuban Crisis on System 465L

The crisis happened to come at a time when the Strategic Air Command Control System (465L) had reached the installation stage. The Strategic Air Command, the SPO, and the contractor (International Electric Company [IEC]) had agreed on a definite time table for installing the necessary equipment and checking it out at the several SAC bases in turn. The contractor not only had arranged for deliveries at each SAC base according to this time table, but also had engaged the necessary technical personnel to supervise the successive installations. At a few SAC bases the work of installation was already in progress or had been completed. SAC headquarters soon decided, however, that it could not tolerate the disruption of its combat operations centers that would be involved. Moreover, the arrival or impending arrival of the equipment and of the International Electric Company representatives posed an obvious security hazard. On 24 October SAC advised the IEC that installation activity would be discontinued until further notice, and the IEC found it advisable to halt all shipments of equipment. There was a partial resumption of shipments on 30 October, but the original time table was a shambles and would have to be almost entirely remade. This meant not only that operational dates would be slipped but also that the Government would incur costs in its contract with International Electric substantially in excess of original estimates.<sup>30</sup>

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30. 465L Documents:

Ltr, ESD/ESSCL (Col R. A. Zais) to ESEH (Dr. H. R. Murphy), subj: "Impact of National Emergency on Air Force Command and Control Systems," 6 Dec 62 (U). [SD #47.]

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**465L Documents (Contd.):**

Msg, J. E. Kahelin, VP, Dir/Opsns, IEC, Paramus, N.J. to Col. R. Zais, Ser #10-62-305, Red Flag Msg #10-11, subj: "Stoppage 465L Shipments," 24 Oct 62. [SD #48.]

Msg, IEC to Col. R. A. Zais, ESSC, Ser #10-62-375, Mgt Activity Rept #10-4, subj: "[RCC Instl, Part 1; AGE, Part 2; Spare Parts, Part 3]," 30 Oct 62. [SD #49.]

Jmsg, SAC to AFBs Westover, March, Barksdale, Offutt and Info cy: L. G. Hanscom Fld, subj: "Installation of 465L Equipment," 30 Oct 62. [SD #50.]

Msg, IEC to Col R. A. Zais, Ser #10-62-381, Red Flag Msg #10-15, subj: "Partial Resumption of RCC Shipments," [Refr. Red Flag Msg #10-11], 30 Oct 62. [SD #51.]

Msg, IEC to Col R. A. Zais, ESSC, Ser #10-62-87, subj: "[Red Flag Rept No. 11-2]," 8 Nov 62. [SD #52.]

Msg, Wm. E. Wendt, ESSC, 31-10-207, to AFOIC Internat'l Electric Corp, subj: "[IEC Red Flag messages]," 31 Oct 62. [SD #53.]

Msg, IEC to Col R. A. Zais, ESSC, Ser #11-62-43, Mgt Activ Rept #11-1, subj: "[RCC Instl, Part 1; AGE, Part 2; Spare Parts, Part 3]," 6 Nov 62. [SD #54.]

Jmsgfm, ESD, ESSC; Col R. A. Zais, ESSCL-9-11-41 to Comdr AFSC, subj: "[Redline Presto]," Nov 62 (C). [SD #55.]

Msg, IEC to Col. R. A. Zais, ESSC, Ser #11-62-189, subj: "Management Activity Report No. 11-3," 19 Nov 62. [SD #56.]

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## Impact of Crisis on 473L

On 21 October access to the computer communications console at Hq USAF was limited to personnel with Top Secret clearance. For the next nine days no computer time was available for program checkout. As of 18 November, it was estimated that this situation had delayed the 473L Package B Schedule by 59 man-weeks, and would lead to an additional cost of approximately \$37,000.<sup>31</sup>

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31. 473L Document:

Ltr, P. W. Rocco, 473L Project Leader, to Col E. V. Conkling, 473L SPO (ESSQ), Attn: Mr. E. Van Sickels, subj: "Package B Schedule," 20 Nov 62 (U). [SD # 57.]

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ESD and the Air Defense Aspects of the Crisis

One of the more obvious dangers precipitated by the Cuban crisis was the possibility of a missile attack against the United States from Cuba. It happened that the Radio Corporation of America had built a large radar at Moorestown, New Jersey, which was being used eight hours a day by System 496L (Space Track) as one of its satellite tracking stations, and for another eight hours a day by System 474L (Ballistic Missile Early Warning System) to test the computer program for the BMEWS station in England. On 24 October the Air Defense Command assumed operational control of this radar, faced the screen south in the direction of Cuba, and operated it twenty-four hours a day until 27 November, at which time the radar reverted to its former functions. The nickname for this ADC effort (which also involved certain other installations in the United States) was "Falling Leaves." The impact on Space Track was simply the temporary substitution of another tracking facility in Trinidad, B. W. I. The delay in the BMEWS computer testing might have become serious if it had lasted longer, but as of the end of November the BMEWS SPO did not feel that this experience would affect the operational date of Site III. The only remaining question was how the systems concerned would be reimbursed for the unanticipated costs incurred through a little more than a month of ADC operation.

Another facet of the Falling Leaves project was an effort to modify the Mobile Air Defense Sector site at Thomasville, Alabama; but on 23 November USAF headquarters directed the Air Defense Command "to return Thomasville to its primary mission." Also, apart from the "Falling Leaves" project, the ADC asked the 416L

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SPO to accelerate the installation of an FST-2 radar at station Z-211, Patrick Air Force Base, Florida. The forecast installation date was advanced from 31 December to 21 December.<sup>32</sup>

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32. "ESD and Air Defense" Documents:

("Falling Leaves" SD #58 through SD #67; Thomasville SD #68 through SD #72; Z-211 SD #73 through SD #75.)

Msg, AFSC to AFMTC Patrick AFB, Info to ESD/ESSX (S) AFSC CP 63-66, [Space Track], 26 Oct 62. [SD #58.]

Msg, Hq USAF to ADC ENT AFB, Info to ESD (S) AFOOP 93232, [Summarizes previous directions pertaining to ADC, NORAD, & USAF], 26 Oct 62. [SD #59.]

Msg, ADC ENT AFB to USAF, Info to ADC CCDSO (S-NFN) ADOOP-ES 2942, [Assignment of nickname], 30 Oct 62. [SD #60.]

Msg, BMEWS ESD to RCA, Moorestown, N.J. (S) ESSB 30-10-120, subj: "Operation of Moorestown NJ Tracker Test Facility," n.d. [SD #61.]

Msg, ADC ENT AFB to CSAF, Info to 496L SPO Hanscom Fld (S-NFN) Exc Canada ADOOP-ES 2980, [Secret message AFOOP-DE 93233, dtd 26 Oct 62], 1 Nov 62. [SD #62.]

Msg, ASD ENT AFB to Det 3, ASDEF Div, Info to ADC CCDSO (S) 9 RDC-034, subj: "(U) Satellite Signature Analysis," Oct 62. [SD #63.]

Msg, ASDEF Div ENT AFB, Info ADC ADLSP & ADC ADOOP ENT AFB to ADC CCDSO (S) RDC-035, Attn Col Hensinger at AFMTC, subj: "(U) Satellite Signature Analysis," 5 Nov 62. [SD #64.]

Msg, Hq USAF to ADC ENT AFB, Info to ESD (S) AFORQ-AD/C 94569, [Trinidad radar], 6 Nov 62. [SD #65.]

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**UNCLASSIFIED****"ESD and Air Defense" Documents (Contd.):**

Msg, ADC ENT AFB to CSAF, Info to ESD PROPS and ADC CCDSO L. G. Hanscom Fld (S) ADABF-O TACB, "Re: Obj. (1) ESD proposal for Funding Operation of Mount [REDACTED] site as BMEWS Sensor," 15 Nov 62. [SD #66.]

Msg, AFSC to ESD/ESSB (S) SCSEW 27-II-100, [REDACTED Tracker], Nov 62. [SD #67.]

Msg, ESD L. G. Hanscom Fld to ROAMA, [Telecon between Col Hartung & Lt Col (C) ESSG-26-10-183-E, [Telecon between Col Hartung & Lt Col (C) Both of ESD/ESSGD], 26 Oct 62. [SD #68.]

Msg, AFSC to ESD/ESS, ESSB & ESSG (S) AFAC CP 10-12 [Re: AN/FPS-49, AN/FPS-35 etc.], 26 Oct 62. [SD #69.]

Memo for Record by Lt Col Harold Beth, Jr., Avig Cn, Dir & Ident Div, 416L SPO, subj: "Telephone Call from Capt [REDACTED] of Special Fixes at Thomasville, Alabama [REDACTED Site]," 29 Oct 62. (Memo to: ESSG.) [SD #70.]

Memo for Record by Capt James R. Hendricks, ESSGCD-4, subj: "Installation of SLBM Test Equipment in the AN/FPS-35 at Thomasville, Ala. (TM-197)," 30 Oct 62. [SD #71.]

Msg, Hq USAF to ADC ENT AFB, Info to ESD/ESSGD (S) AFORQ 97311 [Laredo tracker release and Recovery of Thomasville mission], 24 Nov 62. [SD #72.]

Msg, ADC ENT AFB to ESD/ESSGC (U) ADONAC-AN 2-063 [Ref: ESD msg ESSGC-2-22-10-144E, 22 Oct 62], 30 Oct 62. [SD #73.]

Msg, ESD L. G. Hanscom Fld to ADC ENT AFB (U) ESSGC-27-11-43-E, subj: "Installation of AN/FST-2B at Site Z-200," 6 Nov 62. [SD #74.]

Extract from ESD Wkly Digest Nr. 62-45, 9 Nov 62, p. 1  
[SD #75.]

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GLOSSARY

ABW	Air Base Wing
Actg	Acting
ADC	Air Defense Command
AFB	Air Force Base
AFCS	Air Force Communications Service
Atch(s)	Attachments
BMEWS	Ballistic Missile Early Warning System
Br	Branch
Ch	Chief
Comdr	Commander
CSAF	Chief of Staff Air Force
Det	Detachment
Dir	Director
Div	Division
Hq	Headquarters
Jmsgf	Joint messageform
Mgt	Management
Medcom	Acronym for System 486L, Mediterranean Communica- tions System
Msg	Message
n	Note
Ofc	Office
Ops	Operations
Plng	Planning
POL	Petroleum, oil, lubricant
RCA	Radio Corporation of America
RCS	Reports Control Symbol
ROAMA	Rome Air Materiel Area.

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## GLOSSARY (Contd.)

SAC	Strategic Air Command
SD	Supporting Document
SPACECOM	Term assigned to programs comprising Air Force world-wide and space oriented communication programs.
SPO	System Program Office
Subj	Subject
Sys	System(s)
TAC	Tactical Air Command
TC Wg	Troop Carrier Wing
WECO	Western Electric
Wkly	Weekly

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**UNCLASSIFIED****SUPPORTING DOCUMENTS**

for "Cracker Jack"

1. Msg, AFSC, SCE 23-10-56 [ALAFSC 1425/62], to ALAFSC, subj: "Documentation of USAF Capabilities in Contingency Action," 23 Oct 62 (classification changed from TS to For Official Use Only, 5 Nov 62).
2. Memo, Hq AFSC, SCEH to All Division/Center/CMR Historians, AFSC, subj: "Documentation of Current Contingency," 6 Nov 62, w/2 Atchs: (1) Memo, AFSC, SCGC, subj: "Records of Special Command Activities," 1 Nov 62 and (2) ltr, USAF, AFCHO, to Hq AFSC (SCEH), subj: "Documentation of Current Contingency," 5 Nov 62 (For Official Use Only).
3. Memo, Hq ESD, ESC--Comptroller, to All Elements ESD, subj: "Identification of Costs Incurred as a Result of the Cuban Situation," 31 Oct 62 (U).
4. Memo, Hq ESC, ESC--Comptroller, to All Elements ESD, subj: "CRACKER JACK," 2 Nov 62 (U).
5. Msg, AFSC, SCANC-2/22-10-15 [ALAFSC 1424/62], to ALAFSC, subj: "[Cuban Situation]," 23 Oct 62 (S).
6. Memo, Hq ESD, ESOLO, to ESG, subj: "Command Post Deficiencies," 28 Nov 62 (U) w/Tabs A thru G (Tabs B and F marked Confidential).
7. Ltr, Hq ESD, ESOLO to AFSC (SCIA), subj: "ESD Implementing Actions to AFSC, WPB/WPS and AFSC Message CG-1 Dated 25 Oct 62," 9 Nov 62 (S), w/2 Atchs: Status Rept Summary (S) and Composite Rept: Memo, Lt Col Robert B. Brown, Ch, Ops Br, Ops Plng Div, Plans and Programs to ESO with subj: "ESD Response to Gen. Schriever's Message of 25 Oct 62," 6 Nov 62 (C).
8. Memo, Hq 3245th Air Base Wing, CWA, subj: "Implementing Instructions for 'MINIMIZE,'" 24 Oct 62 (U).

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9. Memo for Record by Col Charles M. Smith, Ch, Programs Div, Plans and Programs, subj: "Telecon - Col Reber, AFSC and Col Smith, ESD," 24 Oct 62 (U).
10. Msg, AFSC, SCSA (SDO) 23-10-5 [ALAFSC 1430/62], to ALAFSC, subj: "[Review of USAF R & D Summary RCS AF-R13]," 23 Oct 62 (U).
11. Msg, ESD, ESOP 24-10-39, to AFSC, subj: "[ESD Review of AFSC Published Program Listing; Recommended Realignment of Some Systems and Non-systems]," 24 Oct 62 (S).
12. Msg, AFSC, CP 63-19 [ALAFSC 1435/62], to ALAFSC, subj: "[AFSC Laboratories Urged to Review In-house and Contractual Programs]," 24 Oct 62 (C).
13. Msg, AFSC, AFSO CP 63-25, to ESD et al., subj: "[Re-evaluate Reported Production Compression Capability Plans, etc.]," 24 Oct 62 (S).
14. Msg, AFSC, CP 63-45 [ALAFSC 1446/62], to ALAFSC, subj: "[Clarifies AFSC CP 63-19 msg and also, applicable to all activities]," 25 Oct 62 (C). (See SD-12 above.)
15. Memo, Hq ESD (ESSJS) Col Norman J. McGowan, Deputy for Sys Mgt, to All SPOs and Dir of Comm. Programs, subj: "War Planning," 24 Oct 62 (U).
16. Memo, Hq ESD (ESSDL) Col Joseph A. Plihal, Sys Prog Dir, SPACECOM, to ESSJS, subj: "War Planning," 31 Oct 62 (S).
17. Msg, AFSC CP SCT 63-201 [ALAFSC 1501-62], to ALAFSC, subj: "[Activities Not Yet Report d, A Deadline Date of 5 Nov 62; Negative Repts Required]," 2 Nov 62 (U).
18. Ltr, Hq ESD, Ofc of Comdr (signed by Maj Gen Terhune), to AFSC, subj: "(U) Emergency Program Actions," 7 Nov 62 (U).

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19. Ltr, Hq ESD, Ofc of Comdr (signed by Col R. M. Wray, Vice Comdr), to AFSC, subj: "(U) Emergency Program Actions," 9 Nov 62 (U).
20. Msg, AFSC, SCCB 25-10-2 [ALAFSC 1449/62], to ALAFSC, subj: "Funding for Expenses Incidental to Implementation of the President's Statement of 22 Oct 62," 25 Oct 62 (For Official Use Only).
21. Msg, ESD, ESCB 31-10-12-E, to AFSC, subject same as SD-20, 31 Oct 62 (For Official Use Only). SD-22, 23, and SD-24 below refer to same subject as SD-20.
22. Msg, ESD, Budget Div, ESCB 9-11-2-E, to AFSC, 1 Nov 62 (U).
23. Msg, ESD, Budget Div, ESCB 16-11-3-E, to AFSC, 16 Nov 62 (U).
24. Msg, ESD, Budget Div, ESCB 23-11-4-E, to AFSC, 23 Nov 62 (U).

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## SUPPORTING DOCUMENTS (Contd.)

25. Msg, CSAF, AFOAC-OP 92559, to Hq ESD, ESSDW, subj: "[Availability of MCR-85 in CONUS produced European Tropo Networks]," 22 Oct 62 (S).
26. Msg, ESD, ESSDW-23-10-216-E, to CSAF, AFOAC-OP, subj: "[Availability of Items Cited in AFOAC-OP 92559]," 23 Oct 62 (S).
27. Msg, Hq USAF, AFOAC-OP 93030, to ESD, ESSDW, subj: "[Assemble All Components, Power Equipment, and Transportable Antennas for Cited Tropo Equipment]," 24 Oct 62 (S).
28. Msg, CSAF, AFOAC-OP 94159, to ROAMA, AFSC, ESD, et al., subj: "Assignment of Project RED SLIP Nickname," 2 Nov 62 (S).
29. Msg, ESD, ESSDW-29-10-246-E, to USAF, AFOAC-OP and AFSME, subj: "Daily Status Project SCABBARDS," 29 Oct 62 (S-NOFORN).
30. Msg, BMEWS/ESD, ESSBC 29-10-112-E, to WECO, subj: "Rehab of AN/FRC-39 Vans at Camp Kilmer," 29 Oct 62 (S).
31. Msg, ESD, ESSDW-7-11-46-E, to USAF, AFOAC-OP and AFSME, subj: "Daily Status Report Project RED SLIP," 7 Nov 62 (U).
32. Msg, Hq USAF, AFOAC-OP 73059, to AFSC (Info cys: ESD, AFLC, ROAMA, et al.), subj: "In Philippine to South Vietnam Wideband System," 28 Mar 62 (S).
33. Msg, AFSC, SCSED 28-3-134, to ESD, ESSD Spacecom and ESOPC, subj: "Philippine Vietnam Wideband System," 28 Mar 62 (S).
34. Msg, CSAF, AFOAC-OP 95604, to AFSC, ESD/ESSDE, et al., subj: "Project WET WASH," 14 Nov 62 (S).
35. Msg, AFSC, SCSED-19-11-73, to ESD, ESSD Spacecom, subj: "WET WASH," 19 Nov 62 (S).

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## SUPPORTING DOCUMENTS (Contd.)

36. Msg, Hq USAF, AFOAC-OP 94578, to AFSC (Info cy: ESD), subj: "486L," 5 Nov 62 (S).
37. Outline of 485L MEDCOM System Briefing, Agenda, 15 Nov 62 (U).
38. Msg, AFSC, SCSED-23-11-93, to ESD, ESSDW for action, subj: "[Change in submission date for 486L]," 24 Nov 62 (U).
39. Msg, CSAF, AFOAC-OP 93444, to AFSC (Info cy: ESD), subj: "System 486L and Project FEED BACK," 27 Oct 62 (S).
40. Msg, Eastern GEEIA Brookley AFB, ZMMWE 6 2-79, to GEEIA Griffiss AFB (Info cy: ESD, ESSDW), subj: "[Re-routing for Project Feed Back]," 15 Nov 62 (S).
41. Msg, CSAF, AFOAC-OP 96276, to AFSC (Info cy: ESD), subj: "Feed Back," 17 Nov 62 (S).
42. Msg, Hq ESD, ESSDW-21-11-133-E, to AFSC, subj: "[Project Feed Back]," 21 Nov 62 (S).
43. Outline Summary of Meeting at DCA, 28 Nov 62 (S), w/3 Atchs:  
(1) Conference Agenda (U), (2) List of Attendees (U), and  
(3) Meeting at AFOAC on Feed Back, 27 Nov 62 (S).
44. Msg, TAC Langley AFB, DOC-C 2 11951, to 412L SPO Hanscom Fld, subj: "[Use of Tactical Equipment]," 21 Oct 62 (S).
45. Msg, ESD, Det 9 Lindsey AS Germany, ESUHK-2 26-10-500, to ESD, ESSK, subj: "[Termination of System Testing at Site Giebelstadt]," 26 Oct 62 (S).
46. Ltr, Hq ESD, ESSKL to ESEH (Dr. Murphy), subj: "(U) 412L Historical Data," 28 Nov 62 (S).
47. Ltr, Hq ESD, ESSCL to ESEH (Dr. Murphy), subj: "Impact of National Emergency on Air Force Command and Control Systems," 6 Dec 62 (U).

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48. Msg, J. E. Kahelin, Vice Pres, Dir/Ops, International Electric Corp., Paramus, N.J., Serial No. 10-62-305, Red Flag Msg No. 10-11, to Col R. A. Zais, Sys Prog Dir (465L), subj: "Stoppage 465L Shipments," 24 Oct 62 (U).
49. Msg, IEC, Serial No. 10-62-375, Mgt Activity Rept No. 10-4, to Col R. A. Zais, ESSC, subj: "[Re: RCC Installation, AGE Conference, and Spare Parts]," 30 Oct 62 (U).
50. Jmsgfm, SAC, DO-100156, to 8AF Westover AFB, et al. (Info cy: ESD, ESSC), subj: "Installation of 465L Equipment," 30 Oct 62 (U).
51. Msg, J. E. Kahelin, Vice Pres, Dir/Ops, IEC, Serial No. 10-62-381, Red Flag Msg No. 10-15, to Col. R. A. Zais, subj: "Partial Resumption of RCC Shipments," 30 Oct 62 (U).
52. Msg, J. E. Kahelin, Vice Pres, IEC, Serial No. 10-62-87, Red Flag Rept No. 11-2, to Col R. A. Zais, ESSC, subj: "[B.O.D. for EDTCC and DPC areas at SAC, and unloading of EDTCC equipment]," 8 Nov 62 (U).
53. Msg, Wm. E. Wendt, ESSC, ESSC 31-10-207, to AFOIC, IEC, subj: "[Reference IEC Red Flag msgs 10-11 and 10-15 Relative to Stoppage and Resumption of 465L Shipments]," 31 Oct 62 (U).
54. Msg, IEC, Serial No. 11-62-43, Mgt Activity Rept No. 11-1, to Col R. A. Zais, ESSC, subj: "[RCC Installations, funding for AGE Items, Spare Parts, etc.]," 6 Nov 62 (U).
55. Jmsgfm ESD (Col R. A. Zais), ESSCL-9-11-41, to Comdr AFSC, subj: "[Slippage of 465L Operational Capability]," Nov 62 (C).
56. Msg, IEC, Serial No. 11-62-189, to Col R. A. Zais, ESSC, subj: "Management Activity Report No. 11-3," [relates to EDLCC facility, Motorola printer, DPC installation, NCC installation, EDTCC installation], 19 Nov 62 (U).

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## **SUPPORTING DOCUMENTS (Contd.)**

57. Ltr, P. W. Rocco, 473 Project Leader, subj: "Package B Schedule," to Col E. V. Conkling, 473L SPO(ESSQ), MITRE Corp (Attn: Mr. E. VanSickels), 20 Nov 62 (U).
  58. Msg, AFSC, CP 63-66, to AFMTC (Col Fellows), (Info cy: ESD, ESSX), subj: "[Relating to the Spacetrack Mission]," 26 Oct 62 (S).
  59. Msg, Hq USAF, AFOOP 93232, to ADC Ent AFB (Info cy: ESD), subj: "[Summarization of Previous Directions Pertaining to ADC, NORAD, USAF (AFORQ) and (AFOOP)]," 26 Oct 62 (S).
  60. Msg, ADC Ent AFB, ADOOP-ES 2942, to CSAF, ADC(CCDSO), subj: "[Assignment of Nickname 'Falling Leaves'], " 30 Oct 62 (S-NOFORN exc Canada).
  61. Msg, BMEWS/ESD, ESSB 30-10-120-E, to Radio Corporation of America (RCA), Moorestown, N.J., subj: "Operation of Moorestown NJ Tracker Test Facility," n. d. (S).
  62. Msg, ADC Ent AFB, ADOOP-ES 2980, to CSAF and AFSC (Info cys: 496L SPO, ADC CCDSO, et al.), subj: "[Trinidad radar]," 31 Oct 62 (S-NOFORN exc Canada).
  63. Msg, Hq ASDEF Div Ent AFB, 9RDC-034, to Det 3 ASDEF RCA, Moorestown, N.J. (Info cys: ADC CCDSO, et al.), subj: "(U) Satellite Signature Analysis," 31 Oct 62 (S).
  64. Msg, ASDEF Div Ent AFB, 9RDC-035, to AFMTC, Attn: Col. Hensinger (Info cys: ADC ADLSP, ADC CCDSO, et al.), subj: "(U) Satellite Signature Analysis," 5 Nov 62 (S).
  65. Msg, Hq USAF, AFORQ-AD/C 94569, to ADC Ent AFB (Info cy: ESD et al.), subj: "[Trinidad radar]," 6 Nov 62 (S).
  66. Msg, ADC Ent AFB, ADABF-O 3026, to CSAF (Info cys: ESD, ESOPS, et al.), subj: "[ESD Proposal for Funding Operation of Moorestown Site as BMEWS Sensor]," 15 Nov 62 (S).

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67. Msg, AFSC, SCSEW 27-11-101, to ESD, ESSB, subj: "[Release and Return of FPS-49 Tracker]," 27 Nov 62 (S).
68. Msg, ESD, ESSG-26-10-183-E, to ROAMA, Griffiss AFB, subj: "[Relating to Authority Granted Sperry Corp for Shipment of FPS-35 Modifications]," 26 Oct 62 (C).
69. Msg, AFSC, CP-63-83, to ESD/ESS, ESSB, and ESSG (for action), subj: "[Relating to AN/FPS-49 and AN/FPS-35]," 26 Oct 62 (S).
70. Memo for Record by Lt Col Harold Both, Jr., Actg Ch, Det & Ident Div, 416L SPO, subj: "Telephone Calls on Implementation of Special Fixes at Thomasville, Alabama FPS-35 Site," 29 Oct 62 (U).
71. Memo for Record by Capt James R. Hendricks, ESSGD-1, subj: "Installation of SLBM Test Equipment in the AN/FPS-35 at Thomasville, Ala. (TM-197)," 30 Oct 62 (C).
72. Msg, Hq USAF, AFORQ 97311, to ADC Ent AFB (Info cys: CINCNORAD, ESD/ESSGD, and AFSC), subj: "[Release Laredo Tracker from Moorestown and Return Thomasville to its Primary Mission]," 24 Nov 62 (S).
73. Msg, ADC Ent AFB, ADOAC-AN 39373, to ESD, ESSGC, subj: "[Advancement of Installation Completion Date of AN/FST-2B at Z-211; WECO Testing Date Advanced]," 30 Oct 62 (U).
74. Msg, ESD, ESSGC-2 7-11-43-E, to ADC Ent AFB, subj: "Installation of AN/FST-2B at Site Z-211," 6 Nov 62 (U).
75. Extract from ESD Weekly Digest Nr. 62-45, 9 Nov 62, p. 9 (U).

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